

Corrosion resistance enhancement of an anodic layer on an aluminum matrix composite by cerium sealing

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Abstrak

The anodizing process was conducted in an Al7xxx aluminum alloy with silicon carbide which yielded a non-uniform thickness of anodic film with cavities, micro-pores and micro-cracks within it. This phenomenon occurred due to the presence of Silicon Carbide (SiC) particles within the Aluminum Matrix Composite (AMC), which impedes the initiation and growth of the protective anodic alumina oxide layer. Therefore, cerium sealing has been considered as the cheapest and simplest post treatment to remedy the poor anodic alumina oxide film in order to further enhance the corrosion resistance in aggressive circumstances. This paper examined the protection effect of an integrated layer which was composed of an anodized oxide layer and cerium deposits on an Al7075/SiC composite. Electrochemical Impedance Spectroscopy (EIS) was used to examine the corrosion protection effect and the corrosion behavior of an integrated layer in 3.5% sodium chloride (NaCl) solution at room temperature. In this study, anodizing of Al7075/SiC was carried out in a sulfuric acid H₂SO₄ solution at current density values of 15, 20, and 25 mA/cm², respectively at room temperature, 0oC and -25oC for 30 minutes. Subsequently, cerium sealing was conducted in a cerium chlorate plus hydrogen peroxide (CeCl₃.6H₂O + H₂O₂) solution at room temperature and pH 9 for 30 minutes. The best protection effect was found for Al7075/SiC, anodized at 0oC. Field Emission-Scanning Electron Microscope (FE-SEM) examination confirmed that the enhancement of corrosion resistance was due to the cerium deposit formed on the entire surface of the oxide anodized layer.